

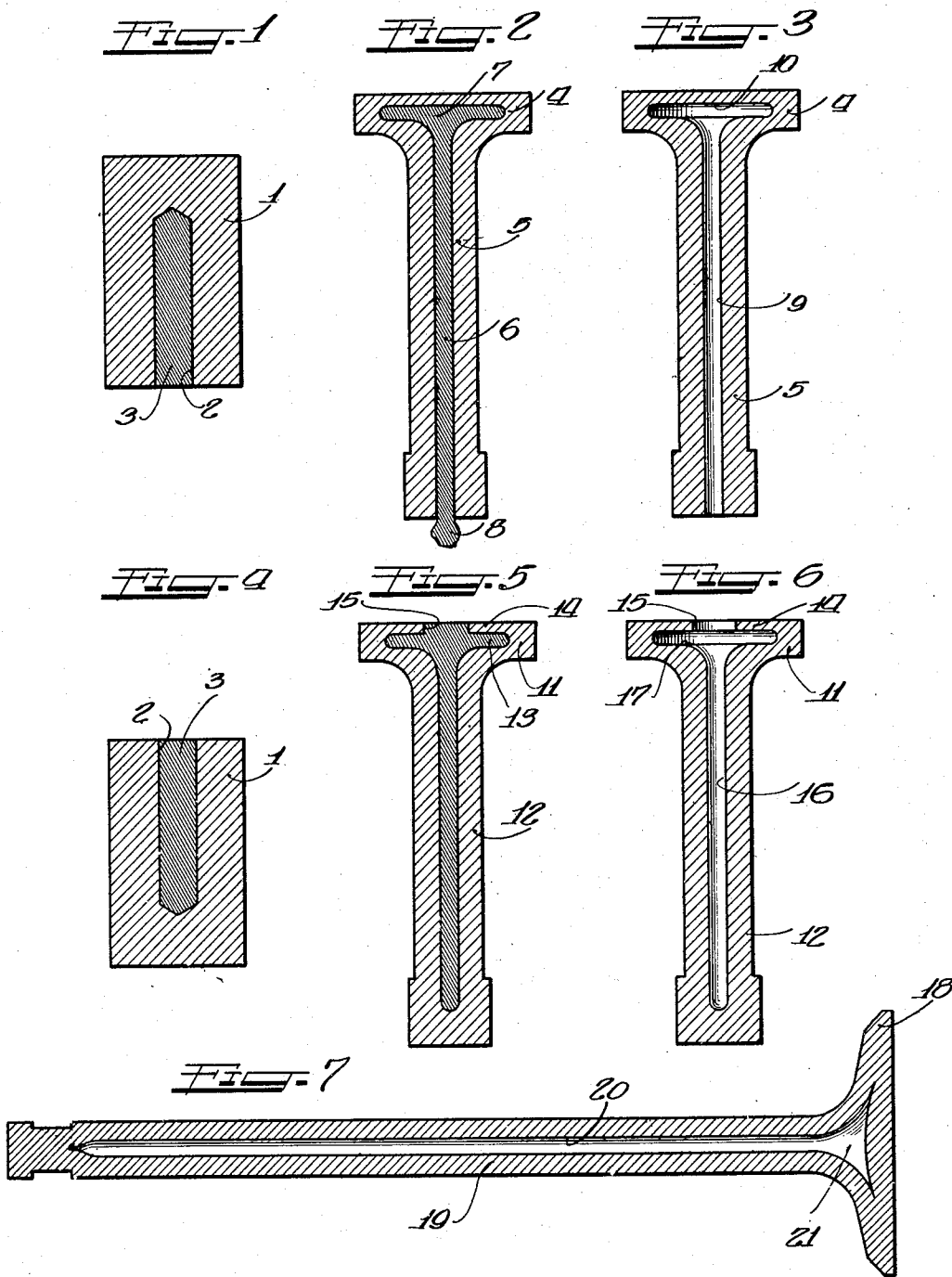
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METHOD OF MAKING HOLLOW VALVES

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METHOD OF MAKING HOLLOW VALVES

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3 Claims. (Cl. 29—156.7)

This invention relates to a method of making valves and particularly to a method of making hollow valves for internal combustion engines.

Hollow stem valves, filled with a cooling medium such as salt have of late years come into use for high compression internal combustion engines. The cost of making such valves, however, has heretofore been very high and consequently their use has been limited to expensive installations where extreme operating conditions require the best regardless of cost.

It is an object of this invention to provide a method of making hollow stem valves at a reasonable cost.

It is a further object of this invention to provide a method of making hollow stem valves which eliminates the step of drilling the valve stem.

It is a particular object of this invention to provide a method of making hollow stem, hollow headed valves which eliminates the costly operations of drilling or reaming the valve head.

These and other objects of this invention will be apparent from the following description and appended claims.

This invention (in a preferred form) is illustrated in the accompanying drawing and hereinafter more fully described.

On the drawing:

Figure 1 is a section view of a blank provided with a metallic insert for use in forming a hollow valve.

Figures 2 and 3 illustrate steps in forming a valve according to this invention.

Figures 4, 5 and 6 illustrate steps in forming a valve according to a modified form of this invention.

Figure 7 is a sectional view of a completed valve.

In carrying out this invention, a blank 1 of the shape shown in Figure 1 is provided. The blank 1 is preferably formed from a suitable valve material such as tungsten steel or chromium steel as by forging or cutting a slug from a piece of rolled stock. A recess 2 is drilled into the blank 1 longitudinally thereof. The recess 2 is preferably cylindrical and concentric with the blank 1, extending through one end thereof and for a considerable distance within the blank.

An insert 3 is fitted in the recess 2 or the recess 2 may be filled by pouring a molten metal therein. In either case, the metal of the insert 3 should have a relatively low melting point compared to the melting point of the metal of blank 1. Such metals as copper and aluminum and

their alloys prove satisfactory when used with the steels set out above.

The composite blank thus formed is heated to a forging temperature and subsequently worked to form a head 4 and stem 5 thereon. This step may be accomplished by extruding the heated blank through a suitable die. Pressure is applied to one end of the blank so as to spread out the head portion and to extrude the stem portion through the die. In this operation, the metallic insert 3 is drawn into the stem to form a core 6 with a portion 7 thereof spread out within the head.

As shown in Figures 1, 2, and 3, the blank 1 is worked with its recessed end downwardly so as to form the stem. The core 6 extends to the end of the stem and due to its expansion during the hot working process, some of the metal of the core may be forced out of the open end of the valve stem 5 as at 8. Heat is then applied to the valve, preferably directly to the metal core 6 to melt the core metal and permit it to be poured out of the valve, thus leaving the bore 9 in the stem and the recess 10 in the head 5.

In the modified form of the invention shown in Figures 4, 5 and 6 the recessed end of the blank 1 is upright, so that in the working of the blank 1, pressure is applied to the recessed end to form it into the head 11 while the closed end is drawn out into the stem 12. The metal of the insert 3 spreads out in the forging or die pressing operation to form a core 13 and the pressure applied to the blank causes the metal thereof to partially cover the core 13 by forming a flange 14 about the core filled aperture 15. Sufficient heat is thereafter applied to the insert and the metal thereof is poured out through the aperture 15 to leave a bore 16 in the stem and a recess 17 in the head of the valve.

The aperture 15 and the lower end of the bore 9 are closed in any appropriate manner as by welding plugs therein, and the valve is finished by suitable forging and machining operations.

The complete valve comprises a head 18 and a stem 19 with a bore 20 therein extending into the head 18 and there terminating in an enlarged recess 21.

It will thus be seen that this invention provides an expedient method of making a hollow valve without the necessity of drilling the finished valve and one in which the recess in the head is formed in the working of the valve blank.

Many changes may be made in the steps of the process and arrangement thereof and I do not wish to be limited otherwise than is necessary by

the prior art and the scope of the appended claims.

I claim as my invention:

1. The method of making hollow valves which
5 comprises providing a metal blank having a blind
bore extending longitudinally from one end
thereof into close proximity to the other end, fill-
ing the bore of the blank with a metal having a
10 melting point substantially below the melting
point of the blank metal, working the composite
blank thus formed to form a valve head on one
end thereof with the insert metal spread out into
the head and a valve stem on the other end
15 thereof integrally united with the head, said
working operation forcing some of the insert
metal out of the opening of the bore to maintain
the bore open during the working operation,
heating the valve thus formed above the melt-
20 ing point of the insert metal, removing the
molten metal and plugging the opening to the
cavity in the valve.

2. The method of making hollow valves which
comprises providing a recessed metal blank with
the recess extending from one end of the blank
25 into close proximity to the other end, filling the
recess with a metal having a melting point sub-

stantially below the melting point of the blank
metal, forging the composite metal blank thus
formed to provide an enlarged head thereon and
an elongated stem with the insert metal spread
out into the head and down the stem, said forg-
5 ing operation effecting the extrusion of some of
the insert metal from the recess to maintain the
mouth of the recess open, removing the insert
metal through said opening to provide a valve
having an enlarged cavity in the head and a
10 communicating cavity extending down the stem
and subsequently welding a plug into the opening
for sealing the cavities in the valve.

3. The method of making a hollow valve which
comprises introducing a metal filler material into
15 the recess of a recessed metal blank, simulta-
neously upsetting one end of the blank and draw-
ing the opposite end of the blank to form the
blank into a valve having a head and stem, said
upsetting operation causing the insert metal to
20 spread out into the head and be partially ex-
truded from the recess, removing the insert metal
from the valve to leave the valve having a con-
tinuous cavity in the head and stem thereof and
plugging the opening to said cavity.

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